POPULAR
Computing
WEEKLY

24 June 1982 Vol 1 No 9

30p

Shark attack on ZX81

Reviews: ZX81 assembler

ICL education tapes

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Telesound 84

Spectrum graphics



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Centipede. In all [illegible] this is the best presented moving graphics program I've yet seen." Phil Garratt, Interface.
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Programs should, whenever possible, be computer printed.

At present we cannot guarantee to return every submitted article so please keep a copy.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week

Editorial

With the advent of the Sinclair ZX Spectrum and the new range of Commodore Vics, there is a growing market for second hand microcomputers.

Budding programmers, who learnt their skills on the ZX80/81, are now looking for more advanced machines. Consequently, they are also looking to trade in their old machines.

The era of the used micro is now upon us.

No one is quite sure, yet, what effects the second-hand market will have on microcomputer users and manufacturers. But some trends are already becoming apparent.

It is now possible for a first time user to buy a second hand 1K Sinclair ZX81 for around £50. This puts microcomputers within range of more people than ever before.

Present ZX81 owners will also find it easier to buy more expensive machines, using the money gained from selling their existing ZX81s.

There are pitfalls in buying second-hand micros, just as there are in buying second-hand cars. But if you take reasonable care to ensure that the micro is in good working order, you could get yourself a bargain.

Next Week

It's an android world and you must master the art of robot control — another game to test your wits

Classified

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ACORN ATOM 12K + 12K. Nearly new with improved keyboard + PSU + Games, £130. Tel 01-868 [illegible]

ZX81 KITS, Sinclair Video £2.05, built £2.55, leads/key £3.75, built £4.55. Memory crashes and too fine slant cured. £2.30 plus 40p post and packing. A. Reader, 45 Alfred Street, Noggs, Birmingham B14 7HB.

ZX81 16K plus over £80 of tapes and books including ICL programme course, £100 one. J. Hall. Tel (0609) [illegible]

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ZX81 16K, condition condition, two books plus leads, £75. Tel 01 471 3381

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VIC-20 and VIC cassette plus prog ramming offer. Cost £[illegible], will deliver anywhere in London. £[illegible] wanted. Tel Slough — 01 760 [illegible]

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Acorn quells fears over BBC delivery

[illegible] full [illegible] BBC Model B [illegible]

[illegible] orders from as [illegible] as November 1981 [illegible] unfulfilled.

An Acorn spokesman ex[illegible] that [illegible] very large [illegible] of the B models were [illegible] to be produced.

He said that the delivery [illegible] being given [illegible] BBC Marketing were [illegible] based on current production figures.

To ease the difficulties some Model As were being converted to Model Bs.

However the main Model A manufacturer Cleartone Electronics has now been sold to the AB Electronic Products Group.

The purchase for an estimated £250,000 ends a period of uncertainty for Cleartone [illegible]


The BBC's [illegible] more

Henry [illegible] man said [illegible] the machine will [illegible] and benefit from the [illegible]

AB Products Group founded in 19[illegible] has a turnover of over £21m in 1981.

John Rad[illegible] BBC Continuing Education, said the Corporation was delighted that a firm financial base had been found for the Cleartone [illegible]

Sinclair aims for the main stream

[illegible] computer [illegible] the [illegible] which [illegible] the new [illegible] terminal full [illegible] memory. The machine uses Sinclair Basic and single key word entry.

Development of the machine is well advanced and pre-production machines are on trial with certain business users for evaluation.

The new micro will sell for less than £3[illegible]

Fewer make a show of it

[illegible]

[illegible] outstanding feature — [illegible] from the first UK [illegible] the Vic 10 — [illegible] number of [illegible] Vic 20 soft[illegible]

[illegible] appeared [illegible] The [illegible] firms my belief that the UK leads the world in micro software expertise.


[illegible]

Commodore hijacks Spectrum to America

[illegible] the Sinclair Spectrum [illegible] Commodore [illegible] America without [illegible]

[illegible] happened at the Commodore Show, Bradbeer said: "[illegible] were interested in seeing the Spectrum so I took mine to show them."

[illegible] Spectrum [illegible] President Commodore Marketing [illegible] asked if he could [illegible] straight [illegible] said [illegible]

[illegible] the [illegible] and [illegible] the States.

Bradbeer [illegible] embarrass[illegible] and [illegible]

He said [illegible] with [illegible] the exhibition [illegible] the Spectrum back.

ZX82 back in full production

[illegible] the Spectrum [illegible] back [illegible] in Dundee [illegible]

[illegible] of the delay [illegible] but estimates [illegible] several thousand [illegible] now on their way to [illegible]

Ad leaflet ejected

Leaflets advertising the Sinclair Spectrum were unceremoniously whisked out of the Commodore show in London on June 3.

The leaflets were an insert into *Micro Forecast*, the free [illegible] paper.

An organiser [illegible] that [illegible] take the leaflets out [illegible] newspaper he would [illegible] stand down in 15 minutes.

A machine that speaks

Wideband Products has just launched a new speech synthesiser.

The unit connects to the micro through an 8-bit parallel port and can be used with most machines including the BBC and PET.

Unlike some types of synthesisers the Wideband model does not have a particular dictionary of words that it can generate but instead is capable of being instructed to say anything. This is because the machine is programmed to recognise phonetic groups rather than whole words.

Each word is fed in as a series of sound groups. In the basic model it is necessary to key in code numbers associated with the various sounds and a dictionary is supplied listing the phonetic groups and their codes.

A software package is also available which enables the synthesiser to recognise the phonetic letter groups directly.

Wideband is currently working on an advanced application for the Anglia Water Authority. The speech synthesiser is incorporated in a unit which will be placed on a river bank. Sensors in the water monitor conditions such as pollution level or water height.

The basic model is £69 and the additional software pack is £10 (both exclusive of VAT).

Watching and waiting in Manchester

David Kelly reports on the first ZX fair to take place outside London

Summer may be said to be smiling on Britain now but at traditionally wet Manchester the shadow of the sun cast a shadow over the ZX Microfair.

It was the first such event to be staged outside London. The weather was dazzling and the people stayed away in droves.

As with the last London show the fair — at the New Century Hall May 29-30 — was spread over two days. There were more than 50 exhibitors and plenty to see so why was the attendance down to few more than 2,000 for the two days? And why was it that many of the exhibitors commented on the slowness of sales?

Mike Johnston, the ZX Microfair organiser was able to pin-point several possible reasons.

The most noticeable feature of the show he said, was the influence of the Spectrum launch, both on the visitors and the exhibitors.

He was quite pleased with the turn-out particularly on the Saturday but the uncertainty generated following the Spectrum launch resulted in lower purchases.

Mike felt the attendance was about right, since the New Century Hall had been chosen to accommodate the sort of numbers that turned up.

When he had been setting up the show in January he had wanted to include as many local companies as possible. In the event, about one third of the stands represented firms operating in the region.

Rumours of a ZX81 price reduction and uncertainty in the Spectrum delivery dates left most people a little bewildered.

Few exhibitors could be sure of their plans while the Spectrum remained undelivered and the same applies to the buyers.

Mike Johnston is very much aware of the situation. He is going ahead with his next London show at the New Horticultural Hall in August but will delay the next regional show planned probably for Bristol or Southampton until after the Spectrum is small issue.

He believes the current mood of despondency cannot last. "People said just the same when the ZX81 was launched — and now look at the number of add-ons and products available for it. Exactly the

Mike ... a chat with ... some of the visitors at the Manchester show



And at times waiting for this ...

same will be true of the Spectrum in a couple of months time."

Of the Manchester show Mike says: "It seems that anything else than the fantastic success we had in the first London show is regarded as a disaster!"

He did not believe that the response in Manchester would alter his plans for future ZX fairs.

The idea of the fairs has always been to put companies and ZX owners together — and to do so as cheaply as possible. It had been important to keep the entrance fee as low as possible — 60p for adults — and to minimise the expenses to exhibitors.

The cost of a stand at Manchester — £35 — was deliberately kept down to encourage small businesses which are just beginning to move.

The next London Show at the New Horticultural Hall will be for one day only and in a much bigger venue. The hall has 20,000 sq ft of space, all in one area, so there will be plenty of room for stands and traders.

Again the show will favour the smaller trader who will benefit from the lower cost of a one-day event.

Mike hopes that this will result in a show with much interest and variety, but it will be interesting to see what the response from the various ZX businesses will be. Many traders at Manchester had been very disappointed with the attendance and their sales.

The New Horticultural Hall ZX Microfair will be held on Saturday August 21.

For further details contact Mike Johnston, 71 Park Lane, Tottenham, London N17.

What's happening

Manchester Acorn User Group meets fortnightly (during school term time only) on Tuesdays at 7 pm in the Abraham Moss Centre, Cheetham. The next meeting will be on June 22. Either telephone (daytime) Barry Pickles on 061-834 1234 or (evening) John Ashurst on 061-681 4962, or write to Barry Pickles, 1 Cromhall Walk, Manchester M8.

North London BBC Micro Users Group is being formed. It is hoped that the group will hold fortnightly meetings once a suitable venue has been found. All interested parties and potential members should get in touch with Jeremy San, 73 Uphill Road, Mill Hill, London NW7. (Tel: 01-959 0114)

Crawley ZX81 Users Club meets every Monday, nearly all the year round (including school holidays) in the Science Laboratory, Ifield School, Lady Margaret Road, Ifield, Crawley, Sussex. The club meets between 7 pm and 9 pm. Membership is £3 per year and the first meeting is free. Contact John Heron, Club Secretary, 23 Petworth Court, Bewbush, Crawley, Sussex. (Tel: 0293 518390)

Southern Gas Micro Club is open to any employee of Southern Gas. The club meets at the Southern Gas RHQ, 80 St Mary's Road, Southampton, and has access to ZX81s, a Vic 20, an Acorn Atom and BBC machines. In addition the club produces Microcom, a newsletter containing club news, reviews and programming hints and articles. Contact Ian Smith, Floor A1, Management Services, Southern Gas RHQ, 80 St Mary's Road, Southampton.

COVER STORY

Shark Attack

You are a missile-base commander in the suburbs of Atlantis. Your mission is to destroy as many sharks as possible with your 30 missiles. You command three numbered silos and choose your firing point via the corresponding keys 1-3.

The shark circles at the top of the screen on the other side of a strong and unpredictable current. The shark doesn't bite, but flies quite aggressively when hit.

The code-loader program and the 1 REM (122 X's) are keyed in first and RUN. Next enter the machine code one byte at a time. The machine code loader will be overrun by the actual program when you key it in, but it is a good idea to SAVE at this point, just in case.

The program uses the whole screen by poking on to the bottom line the status of your missile dump, which decreases as each missile is fired. At the end of the game, your score and a rating are displayed.

The actual machine code is merely a quick-draw subroutine which I adapted in an effort to speed up my program. I also experimented with true/false equations which can, as in line 350, take the place of four lines of IF/THEN statements.

If you happen to bob the shark's tail as it approaches from the right, it does not die. This is because the check for a hit in line 430 PEEKS the position directly to the right of the missile when it reaches line 1. If it PEEKS a space, the death plunge is avoided.

Program Listing "SHARK"

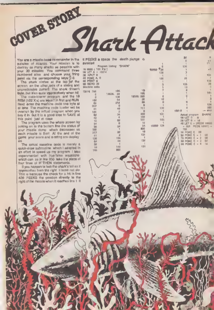
```
10 REM ( 122 X's )
20 LET A = 16514
30 INPUT B
40 POKE A, B
50 PRINT B
60 GOTO 30
```

Machine code

```
16514 255        195         19        1         30
      6   16530  44          195       6         6
      0          130  16550  885 16550 230       1
      188        64          38        130       130
      84         254         36        1         1
      203        0           0         100       3
      91         40          111       1         1
      131        2           0         3         28
      84         34          888       1         1
      42         4           188       7         126
      12         88          201       1         12
      84         0           18        6         6
      36         34          34        10        1
      258        1           800       0         0
      207        36          18        1         1
      81         2           131       130       9
      130        184         1         1         1
      84         44          136       131       6
      30         1           1         1   16619 1
      19         140         131       166
      188        880                   1
                                 16580 131
```

Actual program "SHARK"

```
10 LET D = 0
30 LET S = 10
40 LET E = (PEEK 16396
   + 256 * PEEK 16397) +
   700
50 POKE E, 00
60 POKE E + 1, 58
70 POKE E + 2, 58
80 POKE E + 3, 07
90 POKE E + 6, 14
```





A new game for the 16K ZX81
by Dave McGuire

```
10 REM
20 LET A=16514
30 INPUT B
40 POKE A,B
50 PRINT B
60 GOTO 30
20 LET S=0
30 LET B=15
40 LET E=(PEEK 16396+256*PEEK 16397)+700
50 POKE E,52
60 POKE E+1,58
70 POKE E+2,58
80 POKE E+3,52
90 POKE E+4,14
100 FOR O=0 TO 6
110 POKE E+O+8,167
120 NEXT O
130 POKE 16517,180
140 POKE 16518,3
150 POKE 16516,0
160 PRINT AT 20,0;"SCORE"
170 PRINT AT 21,5;
180 PRINT AT 21,9;"%"
190 LET P=1
200 LET X=1
210 LET T=0
220 IF B<0 THEN GOTO 520
230 IF INKEY$="" THEN GOTO 320
240 LET B=B-1
250 LET T=VAL INKEY$
260 LET M=(T-1)*10+7
270 POKE E+B+8,0
280 FOR U=18 TO 1 STEP -1
290 IF (RND+4)>3 THEN LET M=M-1
300 PRINT AT U+1,(ABS M)-1+(M=0)
310 PRINT AT U,M;" "
320 POKE 16516,X
330 RAND USR 16519
340 RAND 0
350 LET X=X+(P=0)+(X=1)-(X=27)
P=1)
360 LET P=P-(X=2)+(X=28)
370 LET Y=166
380 IF P=0 THEN LET Y=208
390 POKE 16517,Y
400 IF T=0 THEN GOTO 290
410 NEXT U
420 PRINT AT U+1,M;" "
430 IF PEEK ((PEEK 16398+256*PEEK 16397)+(ABS M)+1)=0 THEN GOTO 210
440 POKE 16517,220
450 FOR Z=X TO (629+X) STEP 33
460 POKE 16518,INT (Z/256)
470 POKE 16516,Z-256*PEEK 16516
480 RAND USR 16516
490 NEXT Z
500 LET S=S+1000
510 CLS
520 IF B>=0 THEN GOTO 80
530 CLS
540 LET C=S/1000
550 IF C=1 THEN PRINT TAB 3,"YOU KILLED 1 SHARK FOR"
560 IF C>1 THEN PRINT TAB 3,"YOU KILLED ";C;" SHARKS FOR"
570 PRINT
580 PRINT TAB 8;S;" POINTS"
590 IF C=0 THEN LET D$="(THE SHARK IS THE BLACK THING)"
600 IF C=1 THEN LET D$="SHARK BAIT"
610 IF C=2 THEN LET D$="TAKE UP KNITTING"
620 IF C>=3 THEN LET D$="NOT BAD,NOT BAD"
630 IF C>=5 THEN LET D$="IF I HAD EMOTIONS I WOULD BE MILDLY IMPRESSED"
640 IF C>=7 THEN LET D$="CAPTAIN NEMO WAITS TO KISS YOUR FEET"
650 IF C>=8 THEN LET D$="POSEIDON, I PRESUME"
660 IF C>=11 THEN LET D$="HAVE MERCY ON THEM... GEEZ"
670 IF C>=13 THEN LET D$="SHARKS ARE AN ENDANGERED SPECIES"
680 IF C>=15 THEN LET D$="HAVE YOU MADE ANY PACTS WITH HORNED BEINGS LATELY??"
690 PRINT AT 10,10;"RATING"
700 PRINT
710 PRINT D$
```

Reviews
hardware



Box of noise   Telesound 82

Telesound 82

COMPUSOUND 32 Langley Close
Redditch Worcs B98 0ET
Tel 0725-21438
Price £9.95 including VAT

This small metal box sticks on to the back of a ZX81 and enables you to put sounds through your TV speaker. It is connected to the ZX81 by three crocodile clips covered in insulated sleeves so it can be removed at any time without damaging your ZX81. There is no soldering to be done and no holes to be made in the case.

Once the clips are fixed to the ZX81 the unit may be tested. The audio input to Telesound 82 is via a 3.5mm jack plug fitted to nine inches of cable. It may be plugged into the output of a tape recorder, soundboard or even the MIC socket of the ZX81.

If you have no sound source then a test program is provided so that the unit can be adjusted with the ZX81 providing the sounds. A program is also included to turn the ZX81 into an electronic organ using the lower two rows of the keyboard.

Telesound 82 will produce sounds through the loudspeaker of a TV set whether or not a program is running. It will also work in FAST or SLOW modes. This can be used to advantage as a tape giving instructions can be played through the TV even before the program has been started.

The unit only draws a small current and should not cause any overheating problems with a Sinclair power pack. It does not require any RAM memory to operate and can be used on a 1K or 16K machine.

There were only two problems that I found with Telesound 82. First, the red and black connecting wires were a bit short. If you have one of the larger RAM packs that run along the back of the ZX81 then it could get in the way. Longer leads would have allowed it to be mounted on the side or the top of the ZX81.

The other problem related to a keyboard bleeper that I have built in my ZX81. It also uses the TV Sync signal and the Telesound made this inoperative. I cured this by inserting a 47 ohm resistor in series with the green crocodile clip, allowing both units to work quite happily together.

The unit works best with the sound source volume control on full. Using the TV's volume control to adjust the sound level keeps the background noise down.

Conclusion

This unit makes games and educational uses of the ZX81 much more interesting. A separate amplifier is no longer necessary as the TV's sound channel replaces it. The instructions are clear and easy to follow.

The two programs included with the kit are a FAST mode electronic organ routine and a short test program. Telesound 82 is excellent value for money and, I believe, the only one on the market. SA

RD system

RD Laboratories 5 Kennedy Road Dane End Ware Hertfordshire SG12 0LU Tel 0902 84340
Prices RD8100 £40 RD8101 £16 RD6110 £27.50

The simplest RD system consists of an RD8101 micro-mum and an RD6110 eight bit input/output port. The motherboard is different from most in that it consists of 0.1mm spaced pins which stick up from the motherboard in two parallel rows. There is space for two modules on the RD8101, one on each row of pins.

If more modules are required RD made the RD8100 which is an eight row motherboard in a case. This large motherboard has several advantages over the simple printed circuit board of the micro mum. It is contained in a black plastic box, it guards you and is fully buffered, which means that there are chips built into the box to amplify the signals coming from the ZX80 or ZX81. This buffering allows the modules attached to the motherboard to be removed at any time without crashing the ZX computer.

The 16K RAM pack and printer can be connected to the back of either motherboard so that any modules that you wish to use can also be connected here. An extra power supply for the motherboard can be plugged in to a power socket at the back to relieve the strain on the ZX81's own 5 volt regulator.

The RD6110 provides eight input wires and eight output wires of a memory mapped port which can be used in a variety of ways. This port is one of the few that is fully decoded so that it occupies one address and can be treated like a piece of RAM.

The address of the port can be set to one of 16 addresses between 15552 and 15567 by inserting a wire in a five pin socket on the underside of the module. The connections to the port can be made in two ways: by poking bare wire into the sockets on top of the module or by plugging in locally available 0.1mm Molex pinned blocks. No soldering is required.

The booklet that accompanies each part of the system explains what you can do with the port, from using a 64 key keyboard to a remote testing facility.

The RD8100 is, I believe, a very good system for the experimenter or for schools. You can add as many modules as you require and it does not take an electronics genius to use them. SA

Info and Data

By Barbara and John Janovski, published by Nelson, 206 pages, paperback
Price £3.95

Every user of a home computer comes to the time when he or she wants to learn more about computers. When the games pall or the struggles at unstructured programming cease, relax in a chair with this excellent background book.

Computers, Information and Data was written specifically for school and college use, but do not let that put you off. For one thing, text asides are a good starting point for picking up a basic knowledge of almost any field. Also, this book is the best CSE/Ordinary level computing text-book that I have come across. It is certainly tougher going than some, and has few pictures, but it covers the material carefully and thoroughly.

One point to note is that the book does not include material on programming. This is normal educational practice — different people have different approaches to programming and different machines to program. For similar reasons the authors did not cover the history, logic and social impact of computers.

There are chapters on the nature of the digital machine, data storage, files, hardware, software, systems analysis, programming approaches, processing and applications. The book has plenty of examples and exercises, and the index is excellent.

In every way this is a most useful book whether you are interested in computers for personal or educational reasons. And it comes at a school-book price — good value in other words. K

Reviews
software

ZXAS

Bug Byte Software 98-100 The Albany
Old Hall Street Liverpool
ZX81 16K cassette
Price £5.00

ZXAS is an assembler for the 16K ZX81 which is written in machine code. The program is 5K long and when run relocates itself in the top five k of ram and reduces RAMTOP by five k. A small BASIC portion of the program inputs the start location of the machine code and calls the assembler.

Standard Zilog mnemonics are used with the exception of commas which are replaced by full stops. If the operations are separated by semicolons, more than one can be placed in the REM statements which hold the object code. However this can make debugging a bit harder.

Two hundred and fifty-six labels are allowed, imaginatively called L0 to L255. These are distinguished by placing a colon before them. The assembler is two-pass and jumps using labels are calculated on the second pass.

The assembler works extremely quickly, assembling 20 instructions as the screen is displayed, which takes less than one second. The operation codes and locations in use are displayed along with the mnemonics and the codes' original REM statement.

The program seems bug-free and only has one real fault. This is the lack of a routine to save assembled code on to tape unless the code is first put in a REM statement.

The program loads well in about two and a half minutes. But the casing on my copy was slightly distorted, as it had to be pressed firmly into the recorder. This could cause some tape problems, but the tape itself sounds OK.

Summary
A well thought-out product, which is useful to anyone who is seriously interested in machine-code programming on the ZX81.

AB

Fun To Learn

Available from W H Smith branches, or direct from Sinclair Research, Freepost, Camberley, Surrey GU15 3BR
ZX81 16K cassette
Price £6.95

If you go into your local W H Smith you will see the sombre brown and yellow stripes of the ICL "Fun To Learn" series of software. There are 8 of these tapes and they form a large part of Sinclair's latest release of software for the ZX81. The tapes are:

E1/2 English Literature 1 and 2
E3 Geography
E4 History
E5 Mathematics
E6 Music
E7 Inventions
E8 Spelling

Most of these programs take the form of a race between 1 to 4 people, with a menu of about half a dozen categories within the main subject. For instance the History program will give you the choice of answering questions on, among others, 'Monarchs of Britain', 'When Did He Reign' and 'Pot Luck'. Questions are then set with multiple-choice answers. There is also a teaching mode in some subjects, in which the computer runs through salient points of the subject with dates and various other informative notes.

The Geography program is designed for one person only, and displays a map of England or Europe. The user then answers questions about the towns of England or the countries and capitals of Europe. The computer will also run through the locations of these on the maps in the teaching mode.

Mathematics is set at four levels in each of the four basic disciplines of addition, subtraction, multiplication and division.

Spelling is a test for 6- to 11 year-olds. Sentences are spoken and words within that sentence tested. The correct spelling will then appear and the pupil goes on to the next sentence.

Summary
Attractively boxed and easily loaded, the programs are, however, slightly over-priced. Many of the programs share the same basic algorithm. Even though expert knowledge must have been brought in to set the questions, the duplication of programs should have brought the price down by a pound or two.

The questions are fairly difficult and would probably appeal more to older teenagers and adults when used as a General Knowledge Quiz rather than in a strictly classroom environment.

It must be admitted however that younger children recognise even the harder questions as they come round for the fourth or fifth time. Unfortunately there is no textbook to refer back to and gain further knowledge. Having learnt that disc loaded were invented in 1902 but were not in general use until 1960, it would be nice to know why.

Spelling mistakes occur occasionally but are probably due to careless typing. There are one or two more serious mistakes, such as Sir Arthur Bliss's inclusion in the section on Opera, when Bliss did not write any Operas.

ICL's next addition to their educational range should be a Modular program that would enable the users to set their own questions — there being only a limited amount of data in existing programs.

AB

A-maz-ing Vic Pack

Audiogenic Ltd, PO Box 88, 34-36 Crown Street, Reading
Vic-20 3K cassette
Price £6.95 (including VAT)

A-maz-ing is yet another version of the Pac Man arcade game. The Gobbler wanders around a maze, side-stepping unfriendly ghosts and eating lots of little dots. Quite where it puts them is hard to discover — it is obviously one of those voracious creatures that can eat its own weight several times over.

In the US the original Atari arcade version earned over $1 billion in its first year. But on the strength of this Audiogenic version it is hard to see why.

The major disadvantage of A-maz-ing is that it soon becomes a walk-over. When the program is first run everything is fine. After a short while however the Gobbler becomes rather easy to control, particularly when using the joy-stick option.

Another problem is that the ghosts do not seem that unfriendly. They prefer to remain somewhat aloof and are not terribly interested by the ravenous Gobbler. You can quite happily sneak up behind a ghost and chomp the meals there, secure in the knowledge that the ghost will take some time to turn round.

The game does, however, contain all the features of the original. If you are unlucky enough to be cornered by a ghost you have no hope and must forfeit one of your three lives.

But you can turn the tables on the ghosts by eating one of the four power blobs in the maze. This sounds a tone and causes the ghosts to change colour. It is then possible to eat the ghosts, until the power runs out and the ghosts revert to their normal colours.

The more blobs you eat, the more points you are awarded, with bonuses for swallowing power dots or ghosts.

Basic instructions and the key-board controls are explained on the insert supplied with the cassette.

Summary
The Vic Pack version is a little short of A-maz-ing, but it will undoubtedly appeal to Pac Man enthusiasts.

DK

Open Forum

Open Forum is for you to publish your programs and ideas.
It is [illegible] that your programs are bug free before you send them in. We cannot [illegible] Contributions should be sent to: Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2H 7HF.

How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs.

(The usual fee is £10.)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper avoiding any creasing.

Please enclose a stamped self-addressed envelope.

Ski run

on BBC Micro

The object of the game is to manoeuvre your skier to the 'X' in the bottom right hand corner of the screen without hitting any of the trees. If you miss the 'X' at the bottom of the screen, you restart at the top of the ski slope automatically.

One point to note is that, if you hold down the 'D' key to move left or the 'P' key to move right, your speed increases. But this is not a disadvantage once you have mastered the game.

Dec binary conversion

on Vic 20

A simple program which uses two loops to convert decimal to binary. The first loop

to next page

Ski run
by Alan Wood

```
[illegible]
```

Decimal binary conversion
by Ken Clark

```
[illegible]
```

from previous page

finds the position of the most significant bit while the second loop works out the remaining least significant bits

Big letters

on Vic 20

The program scrolls a message of the user's choice up the screen in large 8×8 letters. Here's how it works:

Lines 0 to 4 print the instructions.
Lines 5 to 7 input the message, print it to the top of the screen and set up the variables.
Line 8 puts the screen codes of the message into an array and sets the print position to the centre of the screen.
Lines 9 to 100 PEEK the character generator, convert the number to binary and then to a series of inverse spaces which make up the characters.

Big letters
by Martin Howe

```
0 PRINT "    BIG LETTERS"
1 PRINT ddTHIS PROGRAM WILL ASK #YOU TO ENTER SOME   dWORDS
 AND IT WILL
2 PRINT dSCROLL THE WORDS IN   #LARGE LETTERS UP THE dSCREEN YOU
MAY HAVE
3 PRINT #COLOUR LETTERS BY      #PRESSING CTRL AND THE #COLOUR WANTED
WHEN YOU
4 PRINT ENTER THE WORDS ":FORF=1TO9000:NEXT
5 PRINT"ddd#PLEASE ENTER MESSAGE ":FORI=1TO2000:NEXT:PRINT c":INPUTA$
6 A$="  "+A$:PRINT c "A$
7 AA=LEN(A$):DIMA(AA+1)
8 FORI=0TOAA-1:A(I)=PEEK(7680+I):NEXT:PRINT          ;
9 FORH=0TOAA-1
10 FORF=32768+A(H)*8TO32775+A(H)*8:A=PEEK(F):FORG=1TO8
20 READB:IFA-B)=0 THEN A=A-B:PRINT r o  :NEXTG:PRINT d55555555 ";:RESTORE
:NEXTF,H
30 PRINT  " :NEXT:PRINT d55555555  ":RESTORE:NEXTH:GOTO8
100 DATA128,64,32,16,8,4,2,1

N.B.
  Because the printer cannot handle graphics the following VIC
  cursor controls have been replaced by lower case letters.
c-CLEAR    d-CURSOR DOWN    r-REVERSE ON    o-REVERSE OFF
h-CURSOR BACK
```

Efficient scrolling

on ZX81

by Peter Sandford

The SCROLL command provides a particularly effective means of display for adventure type programs. Unfortunately the command requires a separate program line each time it is used and cannot be incorporated within PRINT statements. In lengthy programs this can be extremely expensive in terms of memory.

The following machine code routine which requires 4K+ RAM overcomes these limitations and allows the display to be scrolled as many times as required within any one program line. Provided the start address of the routine is defined as a single letter variable at the beginning of the program substantial memory savings can be achieved.

```
START   2A 0C 40    LD HL,(D-FILE)
                               Assign registers
        54          LD D,H
        5D          LD E,L
        01 21 00    LD BC,21h
        09          ADD HL,BC
        01 D6 02    LD BC,02D6h
        ED B0       LDIR
                               Scroll screen
        13          INC DE
        ED 53 0E 40 LD(DF-CC),DE
                               Set system variables to print
        21 21 00    LD HL,0021h
                               at start of line
        22 39 40    LD(S-POSN),HL
        06 20       LD B,20h
                               Clear line 21
        97          SUB A
LOOP    12          LD (DE),A
        13          INC DE
        10 FC       DJNZ LOOP
        C9          RET
                               Return
```

The routine should be stored in a 38 byte REM statement in program line 1. Run the following BASIC program, and enter each

New ZX81 Software from Sinclair.

A whole new range of software for the Sinclair ZX81 Personal Computer is now available – direct from Sinclair. Produced by ICL and Psion, these really excellent cassettes cover games, education, and business/household management.

Some of the more elaborate programs can only be run on a ZX81 augmented by the ZX 16K RAM pack. (The description of each cassette makes it clear what hardware is required.) The RAM pack provides 16-times more memory in one complete module, and simply plugs into the rear of a ZX81. And the price has just been dramatically reduced to only £29.95.

The Sinclair ZX Printer offers full alphanumerics and highly-sophisticated graphics. A special feature is COPY, which prints out exactly what is on the whole TV screen without the need for further instructions. So now you can print out your results for a permanent record. The ZX Printer plugs into the rear of your ZX81, and you can connect a RAM pack as well.

Games

Cassette G1 Super Programs 1 (ICL)
Hardware required – ZX81
Price – £4.95
Programs – Invasion from Jupiter, Skittles, Magic Square, Doodle, Kim, Liquid Capacity.
Description – Five games programs plus easy conversion between pints/gallons and litres.

Cassette G2 Super Programs 2 (ICL)
Hardware required – ZX81
Price – £4.95
Programs – Rings around Saturn, Secret Code, Mindboggling, Silhouette, Memory Test, Metric conversion.
Description – Five games plus easy conversion between inches/feet/yards and centimetres/metres.

Cassette G3 Super Programs 3 (ICL)
Hardware required – ZX81
Price – £4.95
Programs – Train Race, Challenge, Secret Message, Mind that Meteor, Character Doodle, Currency Conversion.
Description – Five games plus currency conversion at will – for example dollars to pounds.

Cassette G4 Super Programs 4 (ICL)
Hardware required – ZX81
Price – £4.95
Programs – Down Under, Submarines, Doodling with Graphics, The Invisible Invader, Reaction, Petrol.
Description – Five games plus easy conversion between miles per gallon and European fuel consumption figures.

Cassette G5 Super Programs 5 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £4.95
Programs – Martian Knock Out, Graffiti, Find the Mate, Labyrinth, Drop a Brick, Continental.
Description – Five games plus easy conversion between English and continental dress sizes.

Cassette G6 Super Programs 6 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £4.95
Programs – Galactic Invasion, Journey into Danger, Create, Nine Hole Golf, Solitaire, Daylight Robbery.
Description – Six games making full use of the ZX81's moving graphics capability.

Cassette G7 Super Programs 7 (ICL)
Hardware required – ZX81
Price – £4.95
Programs – Racetrack, Chase, NIM, Tower of Hanoi, Docking the Spaceship, Golf.
Description – Six games including the fascinating Tower of Hanoi problem.

Cassette G8 Super Programs 8 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £4.95
Programs – Star Trail (plus blank tape on side 2).
Description – Can you as Captain Church of the UK spaceship Endeavour rid the galaxy of the Klingon menace?

Cassette G9 Biorhythms (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – What are Biorhythms? Your Biorhythms.
Description – When will you be at your peak (and trough) physically, emotionally and intellectually?

Cassette G10 Backgammon (Psion)
Hardware required – ZX81 + 16K RAM
Price – £5.95
Programs – Backgammon, Dice.
Description – A great program using fast and efficient machine code, with graphics board, rolling dice and doubling dice. The dice program can be used for any dice game.

Cassette G11 Chess (Psion)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Chess, Chess Clock.
Description – Fast, efficient machine code, a graphic display of the board and pieces, plus six levels of ability combine to make this one of the best chess programs available. The Chess Clock program can be used at any time.

Cassette G12 Fantasy Games (Psion)
Hardware required – ZX81 (or ZX80 with 8K BASIC ROM) + 16K RAM
Price – £4.75
Programs – Perilous Swamp, Sorcerer's Island.
Description – Perilous Swamp: rescue a beautiful princess from the evil wizard. Sorcerer's Island: you're marooned. To escape, you'll probably need the help of the Grand Sorcerer.

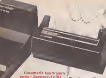
Cassette G13 Space Raiders and Bomber (Psion)
Hardware required – ZX81 + 16K RAM
Price – £3.95
Programs – Space Raiders, Bomber.
Description – Space Raiders is the ZX81 version of the popular pub game. Bomber: destroy a city before you hit a sky-scraper.

Cassette G14 Flight Simulation (Psion)
Hardware required – ZX81 + 16K RAM
Price – £5.95
Program – Flight Simulation (plus blank tape on side 2).
Description – Simulates a highly manoeuvrable light aircraft with full controls, instrumentation, a view through the cockpit window, and navigational aids. Happy landings!

Education

Cassette E1 Fun to Learn series – English Literature 1 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Novelists, Authors.
Description – Who wrote 'Robinson Crusoe'? Which novelist do you associate with Father Brown?

Cassette E2 Fun to Learn series – English Literature 2 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Poets, Playwrights, Modern Authors.
Description – Who wrote 'Song of the Shirt'? Which playwright also played cricket for England?



Cassette E3 Fun to Learn series – Geography 1 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Towns in England and Wales. Countries and Capitals of Europe
Description – The computer shows you a map and a list of towns. You locate the towns correctly. Or the computer challenges you to name a pinpointed location.

Cassette E4 Fun to Learn series – History 1 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Events in British History. British Monarchs
Description – From 1066 to 1981 find out when important events occurred. Recognise monarchs in an identity parade.

Cassette E5 Fun to Learn series – Mathematics 1 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Addition/Subtraction. Multiplication/Division
Description – Questions and answers on basic mathematics at different levels of difficulty.

Cassette E6 Fun to Learn series – Music 1 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Composers. Musicians
Description – Which instrument does James Galway play? Who composed 'Peter Grimes'?

Cassette E7 Fun to Learn series – Inventions 1 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Inventions before 1850. Inventions since 1850
Description – Who invented television? What was the 'dangerous Lucifer'?

Cassette E8 Fun to Learn series – Spelling 1 (ICL)
Hardware required – ZX81 + 16K RAM
Price – £6.95
Programs – Series A1-A15. Series B1-B15.
Description – Listen to the word spoken on your tape recorder. Then spell it out on your ZX81. 300 words in total suitable for 8-11 year olds.

Business/household

Cassette B1 The Collector's Pack (ICL)
Hardware required – ZX81 + 16K RAM
Price – £9.95.
Program – Collector's Pack, plus blank tape on side 2 for program/data storage
Description – This comprehensive program should allow collectors (of stamps, coins etc.) to hold up to 400 records of up to 6 different items on one cassette. Keep your records up to date and sorted into order.

Cassette B2 The Club Record Controller (ICL)
Hardware required – ZX81 + 16K RAM
Price – £9.95
Program – Club Record Controller plus blank tape on side 2 for program/data storage
Description – Enables clubs to hold records of up to 100 members on one cassette. Allows for names, addresses, phone numbers plus five lots of additional information, eg type of membership.

Cassette B3 VU-CALC (Psion)
Hardware required – ZX81 + 16K RAM
Price – £7.95
Program – VU-CALC
Description – Turns your ZX81 into an immensely powerful analysis chart. VU-CALC constructs, generates and calculates large tables for applications such as financial analysis, budget sheets and projections. Complete with full instructions.

Cassette B4 VU-FILE (Psion)
Hardware required – ZX81 + 16K RAM
Price – £7.95
Programs – VU-FILE. Examples
Description – A general-purpose information storage and retrieval program with emphasis on user friendliness and visual display. Use it to catalogue your collection, maintain records of club memberships, keep track of your accounts or as a telephone directory.

How to order

Simply use the FREEPOST order form below and either enclose a cheque or give us your credit card number. Credit card holders can order by phone – simply call Camberley (0276) 66104 or 21282 during office hours. Either way, please allow up to 28 days for delivery, and there's a 14-day money-back option, of course.

sinclair ZX81 SOFTWARE

Sinclair Research Ltd,
Stanhope Road, Camberley, Surrey
GU15 3PS
Tel: Camberley (0276) 66104 & 21282

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR.
Please send me the items I have indicated below.

Qty	Cassette	Code	Item price	Total	Qty	Cassette	Code	Item price	Total
	G1 Super Programs 1	36	£4.95			E2 [illegible]	45	£6.95	
	G2 Super Programs 2	[illegible]	£4.95			E3 [illegible]	46	£6.95	
	G3 Super Programs 3	38	£4.95			E4 History 1	47	£6.95	
	G4 Super Programs 4	[illegible]	£4.95			E5 Mathematics 1	48	£6.95	
	G5 Super Programs 5	[illegible]	£4.95			E6 Music 1	49	£6.95	
	G6 Super Programs 6	[illegible]	£4.95			E7 Inventions 1	50	£6.95	
	G7 Super Programs 7	[illegible]	£4.95			E8 Spelling 1	51	£6.95	
	G8 Super Programs 8	[illegible]	£4.95			B1 Collector's Pack	52	£9.95	
	G9 Biorhythms	[illegible]	£6.95			B2 Club Record Controller	[illegible]	£9.95	
	G10 Backgammon	[illegible]	£5.95			B3 VU-CALC	54	£7.95	
	G11 Chess	40	£6.95			B4 VU-FILE	[illegible]	£7.95	
	G12 Fantasy Games	[illegible]	£4.95			16K RAM pack	[illegible]	£29.95	
	G13 Space Raiders & Bomber	42	£3.95			ZX Printer	[illegible]	£59.95	
	G14 Flight Simulation	43	£5.95			Post & packing (if ordering hardware)		£2.95	
	E1 [illegible]	44	£6.95					TOTAL £	

I enclose a cheque/postal order to Sinclair Research Ltd for £

Please charge my Access/Barclaycard/Trustcard no.
Please delete as applicable

Mr/Mrs/Miss

Address

pair of hex codes in turn

```
1 REM 28 bytes
10 for X = 16514 TO 16545
20 INPUT A$
30 IF LEN A$<>2 THEN GOTO 20
40 SCROLL
50 POKE X, 16*CODE A$   CODE A$(2) — 476
60 PRINT X;A$
70 NEXT X
```

To see how the routine is used delete lines 50 to 70 and add the following:

```
2 LET S = 16514
10 PRINT TAB USR S; "THIS IS AN EXAMPLE
   TAB USR S; OF THE USE OF THIS
   SUBROUTINE" TAB USR S; TAB USR S
20 FOR I = 1 TO 30
30 NEXT I
40 GOTO 10
```

Star Trek

on BBC Micro

It is a little known fact that the scripts of *Star Trek* were produced by Paramount's enormous 1960s valve operated computer. I have replicated the program for the BBC Micro. Indeed, it has proved possible to improve upon the original, producing scripts of a higher calibre than those filmed.

Of course, the program produces scripts of variable length. Paramount handled this by inserting fights and noble profile shots to pad out the episodes.

The program will run on either the Model A or B. Make sure that the strings in lines 130 and 505 are identical or the program will never end (that's how they got the motion picture).

Note that the only DATA strings requiring quotes are those containing commas. Also note the spaces which prevent words being split by line feeds.

Partial screen clear

on ZX81

by Calum Steen

After writing a program to help with tax returns I found I needed a program to clear parts of the ZX81's display while leaving the lines showing the totals of each column intact.

The following machine code routine does this very quickly and needed only small changes to make it function as a very fast equivalent to the CLS command. This was considered necessary as the CLS command takes some time when the display and memory are full. It also leaves characters moving up and down the edge of the screen while it is working.

Rather than use the first REM statement and call the routines by USR 16514, which I find hinders the LOADING of some programs, he decided to make use of the NXTLIN system variable. This is the BASIC loader program for the partial screen clear routine.

```
9990 LET A = (PEEK 16661 + 256*PEEK 16630 + 5)
9910 REM 12640270961234007196103436
9920 FOR N = A TO A + 28
9930 INPUT ⊕
9940 POKE N,⊕
9950 NEXT N
```

The program can then be RUN and the decimal codes entered one at a time followed by NEWLINE. This piece of code is 26 bytes long and works as explained in the right hand column, the decimal codes being in the left hand column each separated by a comma.

42,58,64 — LD HL,(16442). Register L is loaded with the line forward for PRINT position
88 — LD B,L. The value is put into register B.
42,14,64 — LD HL,(16396). Register is loaded with address of PRINT position in D FILE.
126 — LD A,(HL) Accumulator is loaded with value from address specified through HL.
254,118 — CP 118 Accumulator decremented by 118
32,8 — JR NZ,8 If result = 0 then jump forward 8 bytes.
5 — DEC B Register B is decremented by one
126 — LD A,B Load accumulator with value in B
254,0 — CP 0 Accumulator decremented by 0
32,4 — JR NZ,4 If result = 0 then jump forward 4 bytes.
24,5 — JR 5 Jump forward 5 bytes
54,0 — LD (HL),0 Memory location addressed through HL is loaded with 0
35 — INC HL Register HL is incremented by 1
24,238 JR 18 Jump back 18 bytes
201 — RET Return to BASIC

Lines 9900, 9930, 9940, 9950 can now be erased.
Line 9900 can be changed to LET RR = USR(PEEK 16630 + ... etc)
And 9930 RETURN

This routine can now be called by GOSUB 9900. Its effect will depend on the last PRINT statement executed. If it is the

```
100 PRINT AT 10,5; ZX81
110 GOSUB 9900
```

then the screen will be cleared from line 10 column 10 to the bottom corner of the screen. If the statement is

```
100 PRINT AT 10,5; ZX81
110 GOSUB 9900
```

then the screen will be cleared from line 11 column 0 to the bottom of the screen. The effect of this will only be seen if the screen was already full of course. Using the property of the last semi-colon the cleared type of display clearing can be obtained.

The second program was written to overcome the slowness of the CLS function. It is 24 bytes long and can be entered using a similar program to the one used previously

```
9890 PRINT AT 0,0
9900 LET A = (PEEK 16408 + 256*PEEK 16405 + 5)
9910 9898 10340470681204001981284
9920 FOR N = A TO A + 28
9930 INPUT ⊕
```

to next page

```
50 MODE7 [illegible] 1,141,131 PRINT S T A R   T R E K [illegible] NEXT VDU31 12 5
[illegible] by I r Bell
70 [illegible]
100 [illegible] ELSE IF [illegible] ELSE X=500+[illegible]
105 [illegible] NEXT
110 [illegible] GOTO 100
120 [illegible]
130 [illegible] out of orbit [illegible] GOTO100
140 PRINT [illegible]
150 [illegible]
[illegible] DEF FNULS [illegible]
310 [illegible]
320 [illegible]
330 [illegible]
340 END [illegible]
500 [illegible] the lives of [illegible]
505 DATA [illegible] out of orbit [illegible]
510 [illegible]
540 DATA [illegible]
550 [illegible]
560 [illegible]
```

Star Trek
by Ian Bell

from previous page

```
6480 POKE N,B
6490 NEXT N
```

The code to be entered is similar to that of the other routine but always assumes that the PRINT position is at line 0 hence the need for the 9800 to ensure that it is. The decimal codes for the program are as follows:

```
48,14,88,8,28,126,204 116,38,8,5 126,004 8
,38,4,34,5,34,4,32,24,205,201
Check lines 9800,9880,9840,9880
Change 6480 to LET PP=USR(PEEK(16488
ADD 9815 RETURN
```

This routine can now be called by GOSUB 9800 wherever a CLS command would previously be used in the main program. The screen clearing operation is far quicker than CLS if the display and memory are completely full

If the program is very long then it may be advantageous to put this subroutine at the beginning of the main program by altering the line numbers and using a GOTO statement to jump over it to start the main program. This will stop BASIC wasting time searching through many line numbers until it finds the one referred to by the GOSUB. This is a point to bear in mind when writing any long program with many GOSUBs that refer to line numbers at the end of the main program. To put these subroutines at the beginning will help speed up program running time

Maze

on Vic 20

This program runs on a standard Vic and is a maze game where you compete against the clock. Movement is through the four function keys and full instructions are included in the program. Take care when keying in the program to put spaces in lines as it adds to the layout of the screen

Hex-decimal converter

on Vic 20

This program is quite straightforward. The control is passed to one of two routines dependant upon the last character entered

If the last character is h the hex to decimal routine is called otherwise the input is checked for a numeric value (line 190). The error message is displayed if the input does not meet these criteria, and the program returns to the start. The error message is also called if spaces are embedded in the string during the hex to decimal routine.

When using the STR$ function a space is added to the front of the result, line 250

to next page

Maze
by T Walton

from previous page

takes the space out so that the output looks neater. Lines 380 and 240 take care of the hex values A to F by converting them to decimal 10 to 15 and vice versa.

Sketch pad

on ZX81

This sketch pad program enables you to draw you own pictures and diagrams. To start simply type in line 10 as

```
REM XXXX      36X's      XXXX
```

Then type

```
FOR N=16514 TO 16550
INPUT A
POKE N,A
NEXT N
```

and then RUN

Follow on by inputting these numbers in turn.

42 12 64 86 22, 1 30 1 128 8 128 205 79 40 3 144 24 1 128 115 35 32 62 33 158 32 237 35 22 1 26 62 23 197 200 24 227

After doing that delete lines 20 to 50 by typing in the rest of the program. SAVE all your work on to cassette before running. When RUN all will be made clear.

The inverse-video function enables you to edit your picture by changing to inverse and then filling in the white where the mistake was, then change back to normal video.

Maybe the National Gallery will accept some ZX masterpieces or have a special modern art display.

Hex-decimal converter

by Ken Clark

```
[illegible]
```

Sketch pad

by A. Jones

```
 10 REM [illegible]
 19 DIM A$(64)
 20 REM ADRIAN JONES 5/4 1982
 30 PRINT TAB 10; "SKETCH PAD"; TAB 10;
 40 PRINT "THIS PROGRAM IS A POWERFUL AID FOR DRAWING PICTURES ON TO THE SCREEN OR PRINTER"
 50 PRINT ,"THE SCREEN IS USED AS A SKETCH PAD ON A 64 BY 42 GRID (0 0 IS IN THE BOTTOM LEFT)"
 60 PRINT "THE X CO-ORDINATE IS THE NUMBER OF SPACES ALONG THE BOTTOM AND THE Y CO-ORDINATE IS THE NUMBER UP THE SIDE"
 70 PRINT "WHAT DO YOU WANT YOUR STARTING POSITION TO BE ?"
 80 PRINT "X=? "
 90 INPUT X
100 IF X<64 AND X>=0 THEN GOTO 120
110 GOTO 90
120 PRINT X
130 PRINT "Y=? ",
140 INPUT Y
150 IF Y<40 AND Y>=0 THEN GOTO 170
160 GOTO 140
170 PRINT Y
180 LET Y=Y+2
190 CLS
200 GOTO 2000
1000 LET A$=INKEY$
1010 IF A$>"4" AND A$<"9" THEN GOTO 2000
1020 IF A$="I" THEN RAND USR 16514
1030 IF A$="X" THEN GOTO 5000
1040 IF A$="Z" THEN COPY
1050 IF A$="L" THEN GOTO 3000
1060 IF A$="S" THEN GOTO 4000
1070 GOTO 1000
2000 REM PLOT NEW X,Y
2010 LET C=CODE A$-28
2020 LET X=X+((C=8)*(X<63))-((C=5)*(X>0))
2030 LET Y=Y+((C=7)*(Y<43))-((C=6)*(Y>3))
2040 PLOT X,Y
2050 GOTO 1000
3000 REM LINE ROUTINE
3010 PRINT AT 21,0;"POINT1- HOW MANY SPACES ALONG ?"
3020 INPUT A
3030 IF A>=0 AND A<64 THEN GOTO 3050
3040 GOTO 3020
3050 PRINT AT 21,0;"POINT1  HOW MANY SPACES UP ?"
3060 INPUT B
3070 IF B>=0 AND B<42 THEN GOTO 3090
3080 GOTO 3060
3090 LET B=B+2
3100 PRINT AT 21,0;"POINT2. HOW MANY SPACES ALONG ?"
3110 INPUT C
3120 IF C>=0 AND C<64 THEN GOTO 3140
3130 GOTO 3110
3140 PRINT AT 21,0;"POINT2. HOW MANY SPACES UP ?"
```

Square roots

on Vic 20

Here are two suggestions for generating square roots on a Vic 20. Both first write the number T as T=X*4↑N with N an integer and .25<=X<1.

The first method then approximates SQR(X) by linear approximations using knowledge of square roots of (5/10)², (6/10)², (7/10)², (8/10)², (9/10)², and (10/10)². The second method approximates SQR(X) by using a quadratic obtained by using the square roots of (5/10)², (7/10)² and (10/10)². Finally the approximation is completed by a Newton method.

Fog

on ZX81

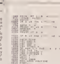
In this 5.75K program the idea is to get from one side of the grey fog to the other. However there are a number of invisible objects which you must get past to reach the other side. You must also avoid a pursuing zombie and watch out for the mines. But do not take too long or you will run out of time.

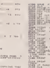
When the game starts you will receive instructions. The screen will go black for a few seconds and then the fog and a time gauge will appear. You are represented by a > sign while the zombie appears as a Z. If you find that you cannot move then you have hit a wall and will have to try a different direction.

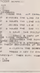
REM statements show how the program is structured. Line 1 gives a 24 line screen. Putting all the instructions in one string enables them to be printed one character at a time.

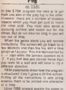
Lines 2000 onward enable the game to start straight from loading. However when SAVING you must type RUN 2000 instead of the normal SAVE. My high score is 26. If you do better then change line 366.

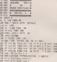






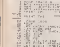






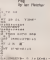
Square roots
by Cees Koenowski







Fog
by Ian Fletcher



```
220 LET Y=Y-(INKEY$="8")+(INKEY$="5")
225 IF H=47 THEN GOTO 400
230 IF Y>=98 THEN GOTO 300
231 IF L<=3 THEN GOTO 240
232 IF J>X THEN LET J=J-1
233 IF J<X THEN LET J=J+1
236 IF K>Y THEN LET K=K-1
237 IF K<Y THEN LET K=K+1
239 LET Z=1
240 IF A(X,Y)=3 THEN GOTO 390
245 IF J=1 THEN LET J=2
247 IF J=30 THEN LET J=19
248 IF K=1 THEN LET K=2
249 IF K=20 THEN LET K=19
250 PRINT AT F,G;
255 IF Z=0 THEN PRINT AT P,Q;

260 PRINT AT X,Y;
265 PRINT AT J,K;
268 IF J=X AND K=Y THEN GOTO 470
270 GOTO 170
271 REM ***************
272 REM    END OF GAME
273 REM ***************
280 PRINT AT 21,1;"WELL DONE,YOU ESCAPED IN ";INT (60-B)*2;" MINUTES"
285 IF INT (60-B)*2<B THEN GOTO 600
290 GOTO 350
300 PRINT AT 21,1;"UNLUCKY,OUT OF TIME"
310 GOTO 350
320 LET X=F
330 LET Y=G
340 GOTO 170
350 PRINT AT 22,10;"AGAIN ?"
360 IF INKEY$="" THEN GOTO 360
365 LET A$=INKEY$
370 IF A$="Y" THEN GOTO 30
380 IF A$<>"N" THEN GOTO 500
390 STOP
400 FOR I=1 TO 30
410 PRINT AT X,Y;
420 PRINT AT X,Y;
440 NEXT I
450 PRINT AT 21,1;"HIT MINE YOU LOSE"
460 GOTO 350
470 FOR I=1 TO 30
480 FAST
485 SLOW
490 NEXT I
500 PRINT AT 21,1;"ZOMBIE GOT YOU,YOU LOSE"
510 GOTO 350
520 PRINT AT 20,10;"    EM"
530 FOR F=1 TO 50
540 NEXT F
550 GOTO 350
600 PRINT AT 22,1;"EXCELLENT THAT IS A BEST SCORE"
610 FOR A=1 TO 30
620 NEXT A
630 PRINT AT 22,1;

640 GOTO 350
999 STOP
1000 REM ***************
1001 REM   INSTRUCTIONS
1002 REM ***************
1005 LET A$="IN THIS GAME YOU ARE IN A MAZE WHICH IS FULL OF FOG SO YOU CANTSEE WHERE YOU ARE AND YOU HAVETO GET OUT,THE EXIT IS ALONG ALLTHE FAR SIDE YOU MUST GET OUT BEFORE YOU RUN OUT OF TIME THERE IS A ZOMBIE WHO IS OUT TO GET YOU. HE CAN BE SEEN FLASHING, MOVES SLOWLY AND CAN GO THROUGH WALLS BEWARE OF THE FEW MINES                       YOUR MOVEMENT KEYS ARE -     8
      FORWARD                   7
      UP                        6
      DOWN                      5
      BACKWARDS"
1010 FOR I=1 TO LEN A$
1020 PRINT A$(I);
1030 NEXT I
1035 PRINT AT 20,0;"PRESS ANY KEY"
1040 IF INKEY$="" THEN GOTO 1040
1050 RETURN
2000 REM ***************
2001 REM   START GAME
2002 REM ***************
2004 LET M$="MAZE"
```



Knowing where the next byte is coming from

***Stephen Devine** explains how to squeeze programs into 1K by memory-saving techniques*

ZX81 owners are often disappointed by the lack of memory on the basic machine. They often find themselves with programs which are just too long to fit within the available 1K. However, by using various memory saving techniques it is often possible to sufficiently shorten these programs so that they can be run in 1K.

Since the method of storing floating point numbers on the ZX81 uses six bytes for each number, considerable savings in memory can be obtained by replacing all of the numbers in a program (except the line numbers) by equivalent symbols. If the numbers 0 and 1 are replaced by NOT PI and SGN PI respectively then four bytes are saved each time.

For larger single- or double-digit numbers the VAL function can be used. For example VAL "4" saves two bytes since the digit 4 is stored as a string and not as a floating point number.

The CODE function can be used for even larger numbers provided that there is a symbol in the character set which corresponds to the number to be replaced. For example CODE "IF" will replace the number 250.

If the same number is used repeatedly throughout a program then it may be worthwhile assigning that number to a variable at the start of the program and using the variable each time the number is required. If the number 500 appears repeatedly in a program then it could first be assigned to a variable by, say, LET N = 500. Then statements such as LET X = X + 500 could be replaced by LET X = X + N saving five bytes each time.

Replacing all the literal numbers in a program will often save enough memory to enable the program to be run successfully but if not there are some further techniques which can be applied.

One method of saving memory is to reduce the memory requirements of conditional statements. For example a statement of the form IF A = X THEN LET P = P + 1 can be replaced by LET P = P + (A=X)

with a saving of six bytes. Much used statements in arcade type games are those using the inkey function such as:

```
10 IF INKEY$ = "8" THEN LET X = X + 1
20 IF INKEY$ = "5" THEN LET X = X - 1
```

which might be used to move an object back and forth across the screen. These can be replaced by the single statement

```
10 LET X = X + (INKEY$ = "8") - (INKEY$ = "5")
```

saving 20 bytes each time. If the variable is to be incremented or decremented by more than one then the parentheses can be multiplied by the required number, for example

```
10 IF INKEY$ = "6" THEN LET Y = Y + 2
20 IF INKEY$ = "7" THEN LET Y = Y - 2
```

can be replaced by

```
10 LET Y = Y + VAL "2" *
   ((INKEY$ = "6") - (INKEY$ = "7"))
```

saving thirteen bytes.

Many PRINT statements can also be modified to consume less memory. For example when printing instructions many words can often be replaced by single byte keywords.

Single stroke keywords

Take the statement PRINT "ENTER YOUR NAME". This can be replaced by the equivalent PRINT "INPUT YOUR NAME" where INPUT is entered as a single-stroke keyword. This saves six bytes since the spaces before and after the word INPUT are free. Many more keywords such as IF, OR, TO, AND, THEN and others can also be used in this way. However, to enable certain words to be entered it may be necessary to first enter THEN and edit it out afterwards.

When a list of concurrent lines is to be printed such as

```
10 PRINT
20 PRINT
30 PRINT
```

it can be replaced by

```
10 PRINT
```

which in this case saves six bytes.

It should also be remembered that GOTOs and GOSUBs need not be assigned a literal numerical value such as GOTO 100 but can be used with functions. For example the routine

```
10 IF X = 1 THEN GOTO 100
20 IF X = 2 THEN GOTO 200
30 IF X = 3 THEN GOTO 300
```

can be replaced by the single statement

```
10 GOTO 100*X
```

saving a massive 40 bytes.

By using some or all of the techniques outlined above and by experimenting with others you should find that there are few short programs which cannot be squeezed into 1K. Even some larger ones which would normally use up to 2K of memory can be effectively halved and run in 1K.

If a 16K RAM pack is added to the basic machine the conservative use of memory should not be neglected. It makes for very efficient programming and even with 16K of memory there will still be some programs which are just that little bit too long.



There are more ways to find extra bytes than the addition of a RAM pack.

Spectrum

In this new slot various contributors explore different aspects of the ZX Spectrum

Making these graph-ics is easy as pie!

Nick Hampshire explains how to put different shapes into your circles

Line 10: Location of centre of disc on screen.
Line 20: Radius of disc.
Line 30: Increment of radius between circles.

The simple way to draw a disc is to use the CIRCLE command in a program loop. This varies the radius from the vertex of the disc to the outside perimeter, thereby drawing a set of concentric circles. The distance between each concentric circle can be varied by changing the step value in the radius increment loop.

This method will accurately draw a high resolution disc on the screen, but it has two drawbacks: (a) the spacing between the dots in each concentric circle cannot be varied and (b) it is impossible to draw a segment of a disc.

These drawbacks are overcome by the following program.

40 disc centre co-ordinates.
50 radius.
60 spacing between circles.
65 spacing between dots in a circle.

In this program lines 70 to 100 draw a circle on the screen at centre co-ordinates xo, yo, of a radius rs and with a spacing between the dots of dp degrees. It should be noted that line 70 converts the degree angle dot increment into radians.

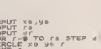
55 beginning angle of segment.
60 end angle of segment.

A variation of the previous program can be used to draw the segment of a disc. This requires two new parameters — the beginning angle of the segment and the end angle.

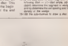
By using a combination of different segments, each with different dot densities, you can draw pie charts — a useful way of graphically representing data. The following program draws such a chart.

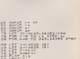
10 set centre to screen co-ordinates xo=150 yo=100
12 set radius of full disc to 40
14-68 the data used for each segment. This is in the following form — p1=start angle, p2=end angle (both determine the segment or wedge size). Dd and dp determine the dot spacing and therefore the density of the wedge.
70-160 the sub-routines to draw a disc segment.





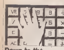
```
10 INPUT xo,yo
20 INPUT rs
30 INPUT dr
40 FOR r=0 TO rs STEP d
50 CIRCLE xo,yo,r
60 NEXT r
```





```
40 INPUT xo,yo
50 INPUT rs
60 INPUT dr
65 INPUT dp
70 LET dp=dp*3.14159/180
80 FOR r=0 TO rs STEP d
90 FOR p=0 TO 2*3.14159 STEP d
100 LET x=r*COS (p)
110 LET y=r*SIN (p)
120 LET x=xo+x
130 LET y=yo+y
140 PLOT x,y
150 NEXT p
160 NEXT r
```

Hand & mouth



Down to the bare essentials

A friend of mine recently received a clever little badge proclaiming "RPN OK RULES". Now we all know that RPN — or Reverse Polish Notation — stands for the system of calculation in Hewlett Packard calculators and that everybody argues as to whether it is far better or far worse than the Algebraic Logic systems of other machines. Have you ever wondered about the derivation of this cool term?

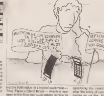
Well, the connection with Poland comes from a man by the name of Jan Lukasiewicz who was born in the Polish city of Lwów in 1878. He was a logician and mathematician as well as an admired and articulate teacher who eventually died in exile in Dublin in 1956. He arrived at an early stage at the conception of calculating the truth value of a logical statement: — True, False or Don't Know — which is now seen in the Boolean Logic tables familiar to computing buffs.

His attempts to strip things down to only the bare essentials were highlighted in the Polish Notation. This notation simplifies the evaluation of arithmetic expressions by eliminating parentheses and all punctuation.

Hewlett Packard have modified this by specifying the operation to be performed after the entry of variables, as opposed to before as on the Polish system. Hence Reverse Polish Notation.

Lukasiewicz was so much wiser than I, so I'll leave the last words to him: "Just as art grew out of the craving for beauty, science was needed by the urge for knowledge. The saying 'art for art's sake' and 'science for science's sake' are equally valid."

John Gowrie





Make macro moves on your micro

If you are writing a long program in assembly language you will find inevitably that some sections of the program are repeated more than once.

A macro assembler is simply a program with all the assembler features I have described in previous articles and the additional facility of assigning a name to a group of commands. For example you could write a macro to set two zero page locations to a particular address.

```
MACRO1  LDA £80
        STA REFERENCE X
        LDA £80
        STA REFERENCE X
```

Whenever you want to use these instructions you simply insert the instruction MACRO1 into your source code listing.

```
START  LDX £1
       MACRO1
       LDX £3
       MACRO1
       LDX £18
       MACRO1
```

When you assemble the program the machine code instruction defined by the macro source code list will be inserted in the right place with all the relative jumps worked out automatically.

A simpler version of the same idea is a facility to copy a block of source code lines from one place to another. In this case you will see all the instructions in the source code listing before it is assembled.

A macro assembler may seem much like using a call to a subroutine. This is not the case. A macro is an assembly time facility while a subroutine is an execution time function. Using a macro command to insert object code uses more memory than calling a subroutine but produces machine code that will run faster.

The Jump to SubRoutine (JSR) and ReTurn from Subroutine (RTS) instructions each take 6 microseconds in a system using a 1MHz clock. If you have saved the CPU registers at the beginning of the SR and restore them at the end that will add a further 36 microseconds. By contrast a macro command uses as much RAM as the component instructions demand on each occasion while a call to a subroutine only uses three bytes.

The time penalty imposed by subroutine calls can give you a measure of the efficiency of the program. Suppose you write a subroutine to double the contents of a zero page location.

```
1  PHP        Push CPU status
2  PHA        Push the accumulator
3  LDA WHEAT  Load the accumulator with WHEAT
4  ASL A      Shift the accumulator left
5  STA WHEAT  Store result in WHEAT
6  PLA        Pull the accumulator
7  PLP        Restore the CPU status
8  RTS
```

You can see that three instructions (lines 3 4 5) carry out the function of the SR and the others would not be present in a macro command.

The percentage inefficiency is calculated thus:

$$\% \text{ inefficiency} = \frac{\text{Total} - \text{Busy}}{\text{Busy}} \times 100$$

If you total up the microseconds for each instruction in the program above, you get the result

$$\frac{30 - 8}{8} \times 100 = 250\% \text{ inefficient}$$

John Dawson

Sound & vision



Stringalonga maximum trickary!

The three routines listed will enable you to manipulate a string array containing a full screen image of 704 bytes. First of all, however you need to put your string together. This can be done as follows. First set RAMTOP with the following three commands:

```
POKE 16388,0
POKE 16389,126
NEW
```

Now LOAD any program which produces an interesting screen image. Then add the following subroutine to that program. I have numbered the subroutine to start at 9000 but you can use any convenient numbers.

```
9000 LET D=1+PEEK 16396+256*PEEK 16397
9010 FOR I=0 TO 791
9020 POKE 32000+I, PEEK (D+I+INT (I/32))
9030 NEXT I
9040 RETURN
```

You will need to find some method of calling that subroutine when a suitable image is displayed on the screen. RUN the program and when you have a good image call the subroutine. When it has run its course, STOP the program and clear it by pressing NEW. Provided you do not turn off the power the image will remain in store over RAMTOP.

The next step is to call this image into a literal string.

```
10 LET A$
20 FOR I=32000 TO 32703
40 LET A$=A$+CHR$ PEEK I
49 NEXT I
50 PRINT A$
```

RUN this program and the image will be displayed. From now on it is important not to use CLEAR or RUN as these will lose A$. Press newline and write the following program over the existing one. (Note that the contents of X$ must be the graphics characters represented on the keys in line 20.)

About Turn

```
10 PRINT A$
20 LET
   X$="1234560WERTYAH214360WQREYTHA"
30 LET Z$=""
40 LET I=PEEK 16396+256*PEEK 16397+1
50 LET I=  TO  -694 STEP 33
60 FOR J=  +31 TO I STEP -1
70 LET X=PEEK J
80 IF X>8 AND X<9 AND X<>3 OR X>128 AND
   X<137 AND X<>131 THEN GOSUB 150
90 LET Z$=Z$+CHR$ X
100 NEXT J
110 NEXT I
120 CLS
130 PRINT Z$
140 STOP
150 FOR K=1 TO 26
160 IF X=CODE X$(K) THEN GOTO 180
170 NEXT K
180 LET X=CODE X$(K+14)
190 RETURN
```

To operate this program use GOTO 1. The screen image will be printed as before but with one important difference — it has been reversed left to right.

The key to the system is the string set up in line 20. This ensures that those characters which are asymmetrical (apart from letters and numbers) are reversed to preserve the integrity of the image. Any words or numbers will be reproduced backwards.

A similar device is used in the next routine, which has the effect of turning the image through 180 degrees. The routine is exactly the same as About Turn except for the following lines which should be altered. As with About Turn, the numbers and letters in the string in line 20 represent the graphics characters which are to be found on those keys. Again, do not RUN the program but GOTO 1.

Tricky Turnover

```
20 LET X$="12345678QWERSDFG6412875G
   QRWDGSF"
40 LET I=PEEK 16396+256*PEEK 16397+694
50 FOR  = TO I -694 STEP -33
80 IF X>8 AND X<11 AND X<>6 AND X<>6 OR
   X>128 AND X<138 AND X<>134 AND
   X<>138 THEN GOSUB 150
150 FOR K=17 TO 32
180 LET X=CODE X$(K-16)
```

This routine produces a straightforward reversal top to bottom. It is the same as Tricky Turnover except for the following lines. The characters in the string in line 20 represent the graphics characters found on these keys.

Upside Downside

```
20 LET X$="12348YQWERTYASDFGH430176
   REWQYTHGSFA"
60 FOR J=I TO I+31
80 IF X>8 AND X<11 AND X<>8 AND X<>6 OR
   X>128 AND X<138 AND X<>130 AND
   X<>136 THEN GOSUB 150
150 FOR K=19 TO 38
180 LET X=CODE X$(K-18)
```

The same rules apply as for the other routines, ie GOTO 1, not RUN, in all cases. The second image is transferred into Z$ which is a literal string 704 bytes long (ie LEN Z$=704).

Nick Godwin

Being backwards in coming forward

This week, two programs using the important pair of commands on the BBC Micro known as VDU5 and VDU4.

Briefly, VDU5 causes the text cursor to be positioned exactly (not just at the nearest print position) in the same place as the graphics cursor. So you can plot text, even in colour, anywhere on the screen. VDU5 switches this effect on, VDU4 switches it off again.

The following programs both generate 'baroque' curves on the screen. But they use words, not lines.

Two psychologically unsettling effects are used: one where the names of colours are written in another coloured text, the other using the words FORWARD and BACK to flash back and forth on the screen, not always doing what they say.

Finally, note that VDU19 N C 0 0 0 is used to change colour number N to actual colour number C — for instance you can make colour 1 (normally red) become blue. The three zeros are there for other purposes and should always be left like that.

Brian Reffin Smith

Peek & poke

Peek your problems to our address. Ian Beardsmore will poke back an answer

DON'T GIVE UP ON DEAR OLD AUNTY

R. [illegible] Road, Northwich, Cheshire writes:

Q I recently received a BBC microcomputer. After trying the test Mr Raffin Smith gave in his article in your April 23 issue, I found that I have a BBC micro with the older operating system. Mr Smith said [illegible] doubtless all will be put right, but what do owners of such machines need to do?

Also the *FX function is inadequately defined and apparently is not going to be put in the guide. Where can I find out about its uses? Even Peek & poke just gave bad answers!

Lastly, when can we expect the impatiently awaited full guide?

A BBC micro owners need to resist the temptation to give up in despair. The full guide should cover all the points you raise in more detail than I can here.

A lot of pressure has been put on the BBC, and it now seems likely that the full guide will be ready for dispatch on June 10. I am afraid that I cannot offer you much more until the guide arrives.

JUST MAKE A NEW GEAR RESOLUTION

A. D. [illegible] Crawley, Sussex writes:

Q In your review of the ZX Spectrum in the May 6 edition you said [illegible] screen resolution of 32 × 24 is adequate [illegible] although this can be enlarged under software control to normal teletext standard.

Please could you explain what this means. What software? When is it available? Does it mean that adequate resolution is made sharper by this process?

A Teletext standard is 40 characters per line as opposed to the 32 which the Spectrum will use normally. As for the software mentioned no one is quite sure what is meant by that.

There is an architecture within the ROM for maintaining a teletext compatible 40 × 24 screen display. But strictly speaking that is firmware. The teletext adaptor is of course hardware.

So far we can only hazard one of two guesses. Either the PR boys who have been telling everyone about this software have in fact confused their terms, or the teletext architecture will be accessed by an as yet unrevealed machine code routine. On reflection I think that I marginally favour the first option.

As for making the resolution sharper I doubt it. With the extra characters per line you are trying to get more, not less, into the same space. Nevertheless indications are that the screen resolution will still be sufficiently good enough for this not to cause any problems.

THERE'S LIFE IN THE OLD DOG YET

David P[illegible] Road, Pembroke Dock, Dyfed writes:

Q As an avid fan of the ZX81 I am very interested in its long life on the computer market. But after reading your review of the ZX Spectrum, I am not sure whether the ZX81 will still be made after the Spectrum becomes available. Please could you tell me what will happen to the ZX81?

A To date, approximately four hundred thousand ZX81s have been made. A few months ago Clive Sinclair signed a much publicised deal with the giant American company Timex to make ZX81s under licence. Conservative estimates maintain that as a result of the deal the ZX81 will become the world's first million selling computer by the end of the year.

In this country, even if half the ZX users decide to change, it will take quite a few months for the new machines to be dispatched. Many of the ZX81s will probably be sold second hand to first time users who quite naturally will be interested in ZX81 material.

So while this country will probably be the first to see the phasing out of the ZX81 there are just too many machines in use for this to be a quick process. I am sure that the ZX81 will enjoy considerable support for some time to come.

AND THE MEMORIES STILL LINGER ON

John Bend[illegible], Gwynedd [illegible] writes:

Q I have a ZX81 with a 16K RAM pack and have written quite a long program. I know [illegible] for the standard 1K machine but how can I find out how much actual memory it has taken?

A The program file starts at the address 16509. The last address of the program file is called D-FILE, which is located at addresses 16396 and 16397. The difference between 16509 and the address in D-FILE is the number of bytes in a program. If you enter as a direct command

PRINT PEEK 16396+256*PEEK 16397-16509

you will get the amount of bytes in your program. If you enter

PRINT PEEK 16404+256*PEEK 16405-16509

you will get the number of bytes occupied by the program, all the variables and the screen. The following commands

PRINT PEEK 16386+PEEK 16412*256-(PEEK 16387-PEEK 16410-16

will give you an idea of how many bytes you have left in which to work at a particular time.

IT'S ALL A QUESTION OF COMPATIBILITY

Alasdair [illegible] Murray Drive, Stonehouse, Scotland writes:

Q I have a BBC microcomputer model A. Having read your review of the ZX Spectrum I am still convinced that the BBC is the best machine yet available. But I am very interested in the £50 ZX Microdrive. Can you please tell me if it would be possible to connect the Microdrive to the BBC Microcomputer?

A There is a general feeling that if the ZX Microdrive meets the quoted specifications then it will be of far greater importance to the world of computing than the Spectrum. After all it does seem to be something of a storage revolution.

It must, however, be borne in mind that the Microdrive has only been seen once in public, and that very briefly at the launching of the ZX Spectrum. To my knowledge no one has had so much as a close look at it yet, let alone a chance to do a thorough benchtest to analyse its full potential.

While it is due to be launched about August, Sinclair Research and launch dates do not always coincide. So I do not think it will be readily available until the autumn at least.

Given that the ZX printer can now be interfaced with other computers, I am sure that the Microdrive will also breed a host of compatible interfaces. Even if an interface costs £100, which I doubt, I am sure that it would sell.

A quick comparison with the New Vic disc drive will illustrate just how important this microdrive could be. With an interface costing £100 you would still get more storage with a Microdrive for almost £200 less than the Vic disc drive.

If the microdrive is not bugged, and that must still be quite a big if, then a race will be on to make it compatible with other computers. But that is several months in the future. Perhaps an early letter to Father Christmas might not come amiss.

Send your questions to Peek & poke, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF

Competitions

Puzzle No 10

Young [illegible] was playing with his pocket calculator the other day when he discovered that 1[illegible] multiplied 21 by 87 the answer 1827 contains the same root digits though differently arranged.

This set him thinking of how many other similar examples were possible. Sets having this property.

How many other sets of numbers are there?

Remember that each set must consist of two two-digit numbers which when multiplied together produce a four-digit number formed from the same numbers. In each case all four digits should be different.

Solution to Puzzle No 6

The simplest way of solving this problem is to generate the values for I N C H in sequence using four FOR/NEXT loops. The process is simplified if we realise that the value of I N C H must be greater than the square root of 10000000 (the smallest product with at least eight digits). We can therefore commence the loop at the value 3. To put into the program below lines to further define the minimum value of I N C H as 3187 would probably be more involved than letting the program run from the starting value of 3000. The only point to be borne in mind is that these first few seven-digit numbers, which cause an error condition in line 90 if the substring was defined as (5 TO 8). Consequently I have used the form (5 TO) which will permit both seven and eight digit numbers to be divided without error. Users of other forms of Basic will need to make their own adjustments.

H can only be equal to either 0, 1, 5, or 6 so units 40 to 60 cannot this.

```
10 FOR I = 3 TO 9
20 FOR N = 0 TO 9
30 FOR C = 0 to 9
40 FOR N = 0 TO 9
50 IF H [illegible] 3 THEN LET H [illegible]
60 IF N = 7 THEN NEXT C
70 LET INCH = [illegible] 1000 [illegible] N [illegible]
80 LET P$ = STR$ INCH [illegible] H
90 IF VAL P$(5 TO) [illegible] NCH THEN PRINT [illegible]
100 NEXT H
110 NEXT C
120 NEXT N
130 NEXT I
```

Answer: INCH = 9376

Winner of Puzzle No 6

The winner is Ian Black, Great Wymondley, Hitchin, Herts, who receives £10

Solution to Crossword No 6

Across 3 Aha 8 Statement 10 Delirious 1[illegible] Loop 13 Memory 14 Length 17 Gene [illegible] Tangents 20 Dimension 21 Ye[illegible]

Down 1 Random 2 Waste my time 3 Celery 4 Value 5 Len 6 Men of Geneva 7 Stop 12 Reagent 15 Hustle 16 Basic 17 Gods 19 Int

Winner of Crossword No 6

The winner is B Turks, Chingford Hatch, London, who receives £10

Rules

The winner of the puzzle will be the reader who in the opinion of *Popular Computing Weekly* has submitted the best solution. Preference will be shown to submissions which show how the entrant arrived at the correct answer and to entries that indicate in any way how a micro might be applied.

The winner of the crossword will simply be the first name out of the hat.

The closing date for both the puzzle and the crossword is Monday, July 5.

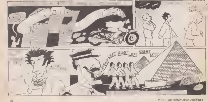
Please mark your envelopes clearly with either CROSSWORD or PUZZLE.

Crossword No 10



CITIZEN PAIN

BY DAVID IRELAND and JAMES MACDONALD



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